

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

o. 1823.—Vol. XL.

LONDON, SATURDAY, JULY 30, 1870.

{ STAMPED .. SIXPENCE.
{ UNSTAMPED, FIVEPENCE

Original Correspondence.

THE CONSETT IRON WORKS.

Consett Iron Works are situated 14 miles south-west of New-castle, to which there is communication by the Blaydon and Consett Railway, and 14 miles from the classic region of Durham, to which there is communication by an extension of the same railway by way of Chester. The works have been in operation 24 years. The site was chosen, in the first instance, as being advantageous for the production of both ironstone and coal, as well as limestone. As regards the latter, this advantage no longer exists, the supply is now got from the Cleveland and the hematite mines of the North. Notwithstanding this drawback, the Consett Works, the formation of the present company, in 1853, have been remarkably prosperous. Mr. JOHN HENDERSON, M.P. for Durham, Chairman of this company, Mr. THOMAS SPENCER vice-chairman, Mr. DAVID DALE is managing director, and Mr. WM. JENKINS is manager. Employment is given to about 5000 persons. The shares of 7l. 10s. are now quoted 3l. 12s. 6d. premium. The works are still extended, in anticipation of increased trade. The establishment at Consett proper consists of blast-furnaces, forges, mills, workshops, and offices. There are three blast-furnaces on the site; two more are in course of erection. The height of those on the site is 55 ft.; they are placed outside; eight cast-iron columns support the body of each. Their diameter at the base varies from 22 ft. to 24 ft. The make of pig-iron in each averages 450 tons per week. The top of each furnace is closed, on the cup and cone principle, and the gases are withdrawn for heating the whole of the stoves. No coal being used for these purposes. A chimney 250 ft. high and 22 ft. inside diameter at the base, decreasing in size to the top, is the medium for withdrawing the gases from the stoves, and will serve for those which will afterwards come into operation. The stoves used at No. 3 furnace are of cast-iron; there are three of them. The principle of this stove is a combustion-chamber. There are 18 double pipes, in six rows, in each stove. The diameter of each is 8 in., and 17 ft. in length. The blast is introduced at the delivery valve. The blast at Nos. 4 and 5 furnaces is by the Whitwell brick stoves. These have been so frequently used that it is unnecessary to give any detailed account of them. After eighteen months' experience of their working, to the approval of, and others are intended to be added to the works in course of erection. There are four of the brick stoves, placed equidistant and near the furnace; the diameter of each is 22 ft. internally, and the height outside is from 25 ft. to 26 ft. These stoves are placed outside. There are twelve 9-inch and eleven 7-inch brick partitions in each, for the passage up and down of ignited gas for a period of two hours, the blast being by contact with the brickwork in those passages during the two hours, and so on alternately. The blast is heated from 1300° at the commencement to 1100° at the end of each period of two hours. The bricks for the construction of the stoves are made at the Consett Company's works, and are well adapted for the intense heat generated in them. The blast of the gas. The blast is conveyed to the tuyere pipes by a wrought-iron circular main, 2 feet 9 inches in diameter. This is lined with 9-inch brickwork, reducing the size inwards to 15 in. There are five tuyeres to each furnace, equidistant. A wrought-iron down pipe from each furnace, lined with 3-in. brick, conveys the waste gas into a main underground culvert, which extends in a straight line behind the furnaces, from whence it is at various points to be utilised in the stoves and under the main blast-tube is 5 ft. in diameter, the blast having communication from all the engines throughout this tube. There are two blowing-engines in one house (at one extremity), of 18 ft. diameter, and working independently. The beam of each is supported on cast-iron standards, steam-cylinders 37 in., blowing-cylinders 8 ft. stroke, going at the rate of 18 strokes per minute. The cylinders are 24 ft. diameter, each worked by connecting-rod between the cylinder and centre. The pressure of blast is about 3½ lbs. per square inch. The other blowing-engines in one house, also working independently, have been in action until lately, only one of these is now in use at the rate of 20 strokes per minute. The other engine is in process of alteration; the beam will be placed on cast-iron standards, instead of resting on girders fixed in the side walls of the house. The blowing cylinders of these are 81 in. in diameter, 8 ft. length, 4½ ft. in diameter. The boilers are suspended from the roof, which cross continuously over the six boilers, having cast-iron pillars of support, resting on stone foundations; each boiler is suspended from the girders by three straps at five points; the pressure of steam is from 40 to 45 lbs.; these boilers are covered with a layer of asbestos. There are eight plain boilers connected to the two first described; these are made 35 ft. only in length, 4½ ft. diameter, to avoid the great strain to which the long boilers are subjected. The 35-ft. boilers are suspended from girders in a similar manner to the others, and are covered over with brickwork. The produce of pig-iron in these three furnaces and two others at Consett is at present about 2000 tons per week. The two new furnaces are designed to be of similar capacity and producing powers to the now in operation at Consett, and to be furnished with the best brick stoves, and all improvements for economising labour and reducing the cost of production. Two blowing-engines are intended to be built in line with the others to meet the requirements of the extensions. The ironstone and limestone are tipped from the trucks on elevated tracks, 10 ft. below the level of the charging-plate of the furnaces; the ovens are built on the same ground for the supply of coke; the materials are all conveyed by means of an inclined plane and a steam-engine to the top of the three furnaces. The pig-iron produced at Consett and Crook Hall furnaces is almost entirely manufactured at the forges and mills erected contiguous to the works at Consett; 150 puddling-furnaces are erected. The hammers are at work operating upon the puddled balls. There are two forges; one of these drives two pairs of puddling rollers on each side of it; the other drives three pairs of puddling rollers on each side of it. There are five rolling-mills; at one of these rails are manufactured, having all the requisite appliances

in connection with it for sawing, punching, and straightening. The other four mills are exclusively for rolling ship-plates, the Consett iron is specially adapted to this purpose, for the manufacture of which of various sizes and qualities these mills are constantly in action on week days and nights; with one exception each engine drives but one mill. One of the plate-mills is on the reversing principle, the rolls are reversed by a clutch fitting into crabs attached to cog-wheels on either side, which wheels revolve in opposite directions. Four powerful shears are erected 7 to 8 ft. wide for cutting the plates, with a separate engine to each.

The product of the plate-mills is very large; 1200 tons per week of ship-plates have been turned out of these mills; at present about 700 tons per week are made. This, we believe, is the largest output of plates at any works in this country, probably the largest in the world. Of rails, Consett works has supplied, and is supplying, some of the largest English railways, and large quantities are also shipped for Russia and America. The make of rails is about 700 tons per week, thus giving a total product of 1400 tons of finished iron per week.

Most of the steam-boilers for the forges and mill engines are heated by the waste heat from the puddling and mill furnaces. The boilers are placed horizontally, have double tubes and two iron chimneys attached. The shell is exposed externally. Each boiler is supplied with heat from two adjoining furnaces. A few boilers are heated with small coal, and a few furnaces have their own stack.

The Crook Hall blast-furnaces are situated about 1½ mile east of the Consett Works. Seven furnaces were erected at the same time as those at Consett, 45 ft. in height; only two of these are at present in operation. The manufacture of pig-iron is intended to be concentrated at the Consett establishment, and the working of these furnaces discontinued. Four blast-furnaces erected at Bradley, subsequently to those at Crook Hall, and of the same type, are now being taken down.

The mineral property leased by the Consett Iron Company is both extensive and valuable. Mr. E. F. Boyd, the President of the Northern Mining Institute, is the consulting mining engineer for the company. There are seven plants at which coal is raised. The coal is all of the bituminous coking quality, obtained from the lowest series of coals in the coal measures, from the Busty Bank and other seams. The output of coal is about 12,000 tons per week. Part of the coal is sold for gas purposes; a large quantity of coal is taken to the forges and mills. There are 560 coke-ovens at Consett and at other places, nearly all of which are in operation. The coke produced from these supplies the blast-furnaces solely with fuel, and a large quantity of coke is sent away for sale. It is supplied to the principal Northern railways for locomotives, to the hematite furnaces in Cumberland and Lancashire, also to some of the Cleveland furnaces, and exported to foreign parts. The coke is very pure, containing but a small percentage of sulphur and ash, and is well adapted for making high-class pig-iron.

To convey materials about the works and at the different pits 10 locomotive tank-engines are in use. The workshops comprise smiths', joiners', and wagon shops, also roll-turning, fitting, and machine shops, together with a large foundry, to meet the requirements of a concern so extensive as that we have briefly described. The fire-brick works of this company are capable of making 60,000 fire-bricks per week.

The Consett Iron Company are not inattentive to the moral and the social well being of their workmen. Nearly all the school buildings have been built by the company, these are dispersed at convenient distances, and not less than 1500 children are educated in the various schools at and about Consett. They are all self-supporting, subsidised by Government grants, but there is still a great lack of desire on the part of the ironworkers and pitmen to send their children to school, and hundreds are not educated at all. The Protestants, Dissenters, and Roman Catholics possess well built, and in many cases handsome churches and chapels; the latter section form the bulk of the population—they have provided their own school buildings. Two buildings are set apart as reading-rooms, provided together with lights and fuel by the company. Numerous papers, books, and periodicals are subscribed for by the younger portion principally of the workmen. Other means of recreation are also provided in connection with these institutions.

The wages at Consett are all paid in coin, an advance on account being paid one week, and fortnightly settlements. There is no truck system in any form. A co-operative store is established and managed by the workmen, the sales at which last year were 16,000l. The company possesses 1500 workmen's cottages at various points on their property. A staff of five surgeons is provided. The company provide the surgery, buildings, and lighting, and also an infirmary for workmen injured in the works or pits, the cost being defrayed by the company. The men contribute the whole of the cost of these surgeons.

NOTES ON CONTINENTAL MINING—No. V.

MINERS IN BELGIUM.—In describing the coal fields and collieries it has been impossible to avoid incidental reference to the colliers, their manners and wages. But below these surface questions lie the habits and economy of their social life, worthy our consideration to copy or avoid. From the figures already quoted it is seen that the average wages for the 120,000 colliers, and for the iron-making workmen throughout the kingdom, is 34 frs. per day, or 912 frs. per annum, while the average of all employed in and about the collieries and works, including women and children, is 708 frs. per annum, or 24 frs. per working day. In the case of the colliers, various contributions out of this have to be paid, amounting 1648 frs. per annum, about 2 per cent. of their earnings.

To provide against accidents and sickness, two distinct arrangements are in operation. The first, called *Caisse de Prévoyance*, is a sort of national club, or sick and accidental assurance company. Membership is not compulsory, but so widely are its benefits admitted and acknowledged that 91 per cent. of the miners are contributors. The annual subscription is 5 frs. each. The second organisation, known as *Caisse de Secours*, is of the same nature, but temporary in its action, and in general one such society or club is attached to each pit. The amount paid by each coalworker is 1148 frs. per annum, making a total for provident purposes of 1648 frs. From these facts we may infer that, so far as assistance in sickness or accident goes, the Belgian arrangements are, on the whole, satisfactory.

But let us look to their normal, every day life and habits. To see the men as they really are we must leave towns and see them in villages, especially those inhabited solely by a mining population. At

work they seem tolerably lively and cheerful, but not loquacious, and compared to the average English workman take but a moderate interest in the progress of the work upon which they are engaged. But let us look at them *en famille*, when the hours of labour are over, and natural bent exercises unlimited sway. A slight repast, in which *soupe maigre* is the principal dish, regales them after the toils of the day, and then the aged and weary lounge on the floors of brick or mud, or recline at full length near the door-step, gazing vacantly at the athletics of the young and vigorous, who occupy the principal street or lane of the village with games of pitch and toss, races, ball, and the like; while the more juvenile portion of the community repeat the same exercises an octave higher, or resort to that most universal of urchin accomplishments, making dirt pies in the gutter. Most of these mining villages were entirely innocent of any means, and apparently of any desire, for mental improvement. Ten hours is the customary day, and in one large colliery we found the hours of labour were from 3 A.M. to 3 P.M., at which hour the night turn commenced. The men do not come up to the day for dinner, but have facilities down the pit for having hot dinners. In most collieries no pit beer is allowed. On Sundays the miner generally gets into better feather, and goes to early mass; and in the after part of the day takes his family into the fields to enjoy the beauties of nature; but it is observed that the walk generally leads round by the inevitable coal pit. This same disposition may often be noticed when a workman with little mental ability is treated to a holiday; he is pretty sure to stroll round by his accustomed works to watch the progress of what are probably the only operations he understands; and his happiness is complete if wife or friend be there to whom he can describe and explain. Animal food is seldom indulged in more than once or twice in the week, and there seems amongst these workmen no representative of that feeling of independence with which the English collier, stricken into cash by the receipt of his week or fortnight's wages, strolls off to his symbol of all that is jolly—the Saturday night market.

One marked difference forces itself on the attention; that is, the much less important role, in the programme of the Belgian worker, played by the *estaminet* than is occupied by the public-house with the English collier. Drunkenness, though by no means common, is not rare; but the light character of the beer, as compared with English ales, is another safeguard to Belgian sobriety. The absence of beggars in the towns and villages seems at first sight to indicate an exceptional state of industrial prosperity, but it is simply due to the fact that the arrangement of many English townships, of not allowing vagrants, is in Belgium a national law. Beggars are directly amenable to the local police, and are summarily disposed of in one of two classes. If unable to work through infirmity or sickness, and having no other means of support, they are moved to Union houses provided by the State. If able to work, and chiefly afflicted with idleness, they are drafted off to the newly-formed work-colony at Hoogstraeten, where various incentives to industry are applied, much in the fashion of a dilute penal servitude.

Many coal firms are taking active steps to improve the sanitary and material condition of their miners, by building cottages according to approved models, and in some instances by making arrangements whereby sums of money are advanced to the workmen at low rates of interest, seldom exceeding 3½ or 4 per cent., to enable them to erect cottages for themselves. This plan is said to work well, but it is evidently only applicable under peculiar conditions of permanency. It is a common subject of remark in the coal districts, that the efforts of capitalists to build better houses for the colliers are only successful when the buildings take the form of isolated cottages, with a patch of garden, be it ever so small, in which the miner can feel some degree of independence, a kind of engineering and monarchical right to arrange things according to his own taste. The miner seems to have an innate horror of living in one of a row of straight, trim houses.

The condition of the Belgian ironworkers is in advance of that of the colliers, and compares favourably with the characteristics of the ironworkers of South Staffordshire, as reported in a paper read before the British Association in 1866, by Mr. J. Jones, F.G.S. Speaking of the forgermen of the Black Country, he says—"The nature of the employment induces a generally rude external appearance, and the strain upon the physical energies lends them, as a rule, to live expensively, and to drink excessive quantities of stimulants. They are singularly improvident as a class, and though they obtain good wages, they have a remarkable genius for spending all they earn, while they devote but little attention to their home comforts. They are vivacious pleasure-seekers, and hence Saint Monday is observed as a general district holiday."

There is a remarkable absence in the Belgian districts of what is so commonly to be seen in the Midland coal field of our country—the spectacle of two or three working miners, with little or no capital, joining together to work a few acres of broken mines, and jeopardising the lives of men by the use of winding-gear and other tackle of the most rude and primitive description. In Belgium a useful regulation enacts that no mining operations shall be commenced until the probable existence of the mineral to be won is proved to the satisfaction of the "Conseil des Mines." The right of minerals is assumed to rest with the Government, and, accordingly, each mine owner has to pay royalty, which is comprised under two heads—first, the *redevance fixe*, an amount of 10 centimes per hectare per annum, or about 1d. for each 2½ acres; the second kind, called *redevance proportionnelle*, averages 2½ per cent. of the net produce. Both these taxes go into the National Treasury, and form a considerable item of State income. The Government exercises a vigilant control over the mining interests, by means of eight inspectors, under the direction of the "Inspecteur-en-chef des Mines," at present Mons. F. Jochams. From interviews with most of these gentlemen, both in the office and in the field, we formed the opinion that they were patient and courteous, and as officials accurately informed and thoroughly hard working. Beyond the payments to Government, except in the rare case where the owner of the land works the mine, there is a further tax payable to the proprietor of the land, also divided, in imitation of the national tax, into two kinds:—1, a fixed rental, generally 1 franc per hectare; 2, proportionate royalty, varying from 1 to 3 per cent. on the net produce, according to the locality, and other conditions of the mine.

From these considerations it is evident that the conditions of Belgian mining are more favourable to the establishment of large firms. Accordingly, we find there some of the largest mining and manufac-

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who "spend money," are more easily tampered with than commercial companies, "who earn money." I freely present to you, but would remark that commercial companies have always shown a strong feeling for the mixture, and have for many years constructed their fire-bars that the mixture can be burnt with advantage, and that this disposition is now stronger than ever, as year by year the advantage in shape of $\frac{1}{2}$ s. d. becomes apparent.

In conclusion, I regret that there should be such an utter want of candour in the remarks which you have made upon a matter of national importance.

Newcastle-upon-Tyne, July 22. THEO. WOOD BURNING.

IMPROVED PUMPING MACHINERY.

SIR.—The second part of Mr. Vivian's invention consists in fitting a tube inside the pump-barrel; one end of this tube carries a valve, a tube which finds its seating; and it has been in operation in Scotland for the last 25 or 30 years. If Mr. Vivian will look in the "Practical Mechanics Journal" about that date, he will see it figured there. Mr. John Reid, of Binnhill, applied it there. A COALMASTER.

GOLD MINING IN NOVA SCOTIA.

SIR.—In the Supplement to the Journal of June 6 I notice an article signed "A Practical Miner of 30 Years' Experience." That article is evidently written for the purpose of injuring the gold mines of Nova Scotia in general, and the Sterling Gold Mining Company in particular. Articles of that kind generally have but little weight, in still it is sometimes necessary to take notice of such productions, in order to give a true statement of facts. The gold mines of Nova Scotia must be good, or they would have been forgotten long ago. They have been worked on a small scale, without adequate capital. A large portion of them have paid dividends, and are still doing so. A great many of the leads are small but rich, and others are large and not poor. Belts of slate and quartz are worked in some districts over 6 ft. wide, yielding 1 oz. of gold to the ton. Leads in other districts, over 4 ft. wide, yield over 6 dwts. Such deposits compare very well with Australia.

I have seen most of the districts in Nova Scotia. The writer of the article has not; he only saw Oldham, and another district, where he spent a few hours. He is very quick in generalising, which is always done by those who do not care for facts. He says that his opinion was the leads in Nova Scotia would not pay. If so, why did he not advise the company he was managing for to give up the mine, not sink any more shafts and money? Had he never, in all his practical experience, seen such a thing done? Was it honorable to have spent money when he thought the enterprise would not pay? If the writer means that he never saw money wasted as it was done here, he did not consider what he was saying. He claims that he managed mines in Cornwall. There he has seen larger machinery erected, and deeper shafts sunk. If such is waste of money to prepare for systematic mining, then, of course, the Sterling Gold Mining Company has been at fault. The machinery erected is going to reduce expenses to a great extent. All underground work is now done by contract which under the management of the writer of that long standing was only partially contracted for. The expenses, so far as the raising of quartz is concerned, are at present very much reduced—over one-third.

The undersigned would be very happy to have the advice of the writer of the letter referred to acted upon by the company—to send a competent man to investigate the present as well as the former mode of management. At the same time, the character of the leads could be put into an altogether different light from what his letter endeavours to make it appear. All the leads are looking well at the deepest points; but the object is now to open the mine, which was never done before. Cross-cutting is now, at last, considered the best method of exploring as well as opening the mine, and this is being done on a large scale.

C. F. ESCHWEILER,
Consulting Engineer.

The letter alluded to was written, or instigated, by a Cornish miner, known in his own country as Richard Bith, but he passed here under the name of Richard Thomas. He was overseer of the works at Oldham for about a year, during which time he was treated with great kindness, through our forbearance, but finally he had to dismiss him. He has now gone to Newfoundland, but before doing so he seems to have revealed himself by writing this letter, which in every material point is both false and malicious. It would make too long a communication to fully controvert his statements, nor would we have thought it worthy of notice had it not appeared in such an influential paper as the *Mining Journal*. The foregoing remarks are confined to what can be proved by scientific and practical men, who possess not only "experience," but also integrity and honour.—EDMUND D. TUCKER, President Sterling Mining Co.]

OUR COLONIAL GOLD FIELDS—NEW ZEALAND.

SIR.—In the Supplement to last week's Journal, under the heading "Our Colonial Gold Fields," I noticed Queensland, the queen of colonies, and destined ultimately to become the queen of nations; the largest, most productive, and most populous empire, kingdom, or republic in the world. I pointed out with as considerable detail as space allowed the various untrodden realms of that marvellous great country, as rich in auriferous treasure, and I endeavoured to point out what has been already done, is doing, and is likely hereafter to be performed in the way of "gold finding."

I will now ask your attention, and the attention of your readers, to New Zealand as a "land of gold." New Zealand is very favourably situated, and as the southern hemisphere increases in political and commercial importance it will, doubtless, assume a very influential position. The country is strictly antipodean to us, and the climate resembles that of England more than does the climate of any other colony. Its topographical peculiarities are as favourable for its future as are its geographical position and climatic conditions. The name, as is well known, and, therefore, only requires a passing notice, applies to a group of islands, more especially two. Through the whole of these islands a ridge of lofty mountains extend from south to north, snow-capped a great part of the year; but this frozen crest gives way at intervals, and irrigating streams descend, clothing the mountain sides with stately forests, refreshing verdure, and beautiful flowers. These topographical features necessarily create rivers, which are to some extent navigable, and offer the means of excellent harbours at their mouths, thus facilitating the commerce of the interior, and opening up "water paths" for the carriage of gold and other mineral products, with which the country abounds. The low lands are fertile, and all the products of the temperate zone may be cultivated there.

The exports consist of flax, hides, tallow, cereals of all descriptions, potatoes to some of the other colonies, and wool. It is probable that preserved meats and cotton, and perhaps jute, will be soon added to the export trade. The aggregate for last year of all exports, irrespective of minerals, was close upon 2,000,000. This is a startling fact when it is recollected that 40 years ago there were only a dozen white inhabitants in the whole group. Only 30 years have elapsed since the first real efforts at British colonisation were made. Now there is a white population in the group of islands numbering a quarter of a million of persons, rapidly increasing, and vast flocks and herds in their possession. Very little is now doing in any of the islands in seeking any metal but gold. Is, however, attested by geologists and mineralogists of experience and authority that most of the more useful metals are obtainable—platinum, copper, lead, silver-lead, and iron, as well as "the precious metals," are, if not in great, yet in considerable quantities within the mountain spurs, ridges, and ravines. Some time ago a singular discovery was made of iron-ore, from which steel alleged to be superior to any other in the world has been made.

The gold fields of the group prove to be much more extensive in range than was for a long time believed, after the discovery of those which first yielded supplies. Now the product is astonishing. Much has been coined and retained in the islands, and the treasures of the colony in gold ornaments and articles is computed to be very great. Hitherto a large proportion of her imports, tea, sugar, and the produce of other Australian colonies, have been paid for in gold. The exports noted—that is to say, irrespective of all carried away by private hands—has been up to end of last year nearly seventeen millions and a quarter. The Middle Island has chiefly imported this wealth, but the Northern Island is now discovered to be the richest gold-bearing of the group. The above estimates of the gold actually produced since the discovery are official, but very inexact, experienced persons will judge just half as much again as the total amount. The mining has been hitherto carried on, as in Queensland, in the rudest manner. In New Ulster, and in a few spots in Middle Island, there is suitable machinery: but the pick, bag, rake, and pan are generally the only appliances of the rough and hardy miners of the day. Where ma-

chinery has been brought to bear the results have been most remunerative. Quartz crushing pays magnificently, and this is the way in which gold will be hereafter obtained in this colony.

It will be seen that in New Zealand, as well as Queensland, gold and other mineral productions are not incompatible with the agricultural productiveness of a country, but aid in bringing it forth. Now that the Maori war is over no other disturbance is likely to take place, and the yield of gold will be great and progressive.

GOLD FINDER.

METALLIC MINING IN THE NORTH—No. V.

SIR.—It is noteworthy that in, and bordering on, the Cambrian Mountain range generally, and more particularly in Cumberland, the mineral wealth is of the most varied, and at the same time rich character. Tin excepted, it may be said that this country contains within its borders all the important minerals, which distributed in greater or less quantity over the rest of the kingdom powerfully contribute to that commercial supremacy which places England in the van of civilisation, and renders her the envy and wonder of the world. Like Cornwall in the extreme South, this northern county must look to the development of her immense mineral resources as the mainstay of her present and prospective prosperity; that these are so little known except to those most immediately interested, and the comparatively small and painful progress, contrasted with the capabilities that has hitherto been achieved, must be in a great measure ascribed to the illiberal, almost prohibitory, policy that the mineral lords have carried out in two many instances, not only exacting an unreasonable royalty adverse to the attraction of the necessary capital, but also making the procurement of sets such a tedious, and almost impossible, proceeding that the undeniable status that Cambria has won as a mining district unmistakably indicates what might be expected were she placed in the favourable position enjoyed elsewhere.

To verify my assertion, that her capabilities are such that, were the dues everywhere moderate, red tapeism eschewed, and a fostering spirit exercised, old Cumberland would rank high as a valuable mining field. The principal minerals, and where mined, may be briefly enumerated here. First in importance as in utility (although, strictly speaking, it is foreign to our immediate subject), the coal field in the eastern division of the county used for local requirements, and the 5, 5½, and 10-ft. seam of Whitehaven and neighbourhood, partly exported, and yielding an abundant supply of cheap fuel to manufacture the iron ore, which as hematite (sesquioxide of iron) is found in the carboniferous limestone, near to the surface edge of the Silurian slates on which that formation rests. The western iron ore district, from its contiguity to the chief town of the western division of the county, may be called the Whitehaven field. It would require an article wholly devoted to the subject to do justice to the unsurpassed magnitude and value of these iron ore deposits, which are generally found in masses of irregular form, varying in thickness up to as much as 60 ft., and extending laterally in some cases as much as 500 ft. in either direction from the shaft (which is usually sunk as near the centre as possible) a dense mass of red ore, yielding from 60 to 70 per cent. of iron. In the celebrated lead-producing district of Alston the mines, although so rich for silver-lead 600 years since that a mint was specially retained at Carlisle for the coinage of the silver extracted therefrom, have been uninterruptedly worked since then, and pursuing their brilliant but unostentatious career at present, seem practically inexhaustible. In this district a large supply of brown iron ore (the hydrous sesquioxide of iron) is found in veins, which, to take the rich Rudrop Fell lode as an instance, yielding enormous quantities of lead in one part of its course, is charged with iron ore only, nearly 20 ft. wide, in another part, a transformation often met with here in the east and west, or bearing lodes, and the result of alteration of strata from which the diverse minerals are segregated, the extension of the railway to Alston, and consequent cheap transit facilities, has created a wonderful development of these iron ore deposits, which being found also occasionally in a stratified position in "flats," hundreds of tons from a very small area have been raised, at as low a cost as 1s. 8d. per ton.

Zinc ore, carbonate and sulphur, manganese, sulphur, and baryta are invariably found associated with lead and copper, in many instances in quantities to pay for special working. Cobalt has been found at Newlands, and antimony at Bassenthwaite; both these ores, though obtained in considerable quantities, have not, however, paid for working. Cumberland slate is well known for roofing purposes, that quarried in the vicinity of Keswick, of a light blue colour, is of very fine quality, and in slabs is in great and increasing demand for various economic purposes. Any description of the Cumberland minerals would be incomplete were reference not made to the world-renowned graphite mine, in the township of Borrowdale. The lode of this mine is about half-way up the flank of Seatallor Fell Mountain, which is 2000 ft. high, and distant nearly eight miles south from Keswick. The black lead (so called from its leaden or slaty-grey colour, although there is not the smallest particle of lead in its composition) is found in detached sops, or bellies (terms significant of the irregular nature of the supply), embedded in transition slate. The graphite is of a fine granular texture, and its purity is such that the manufacturer simply requires to saw the lumps into the desired sizes, after calcination at a red heat in close vessels.

First discovered about 300 years ago, the valuable contents led to many incentives to plunder by workpeople, and also to ceaseless endeavours, often successful, by neighbouring miners to cut through and carry off the mineral, actually culminating on one occasion in a band of miners openly mastering the armed guard placed for its protection, and holding uncontrolled possession for several days. These flagrant depredations were at length met by a special Act, passed in the reign of George II., which made it felony to steal the black lead. The inefficient local Government, and rude lawlessness of that and preceding reigns may partly account for the existence of a state of things which led to the dishonest enrichment of many in the vicinity; but that the temptation to plunder was strong will be evident when it is stated that one of the sops discovered yielded 28 tons, and as much as 45s. per lb. has been obtained for the produce. This price, taken in connection with the fact that the short period of six weeks' working in each year sufficed to supply all requirements, the value of the mineral so raised often ranging from 30,000l. to 40,000l., is the best evidence of the precious character of the deposit. If not instructive, it would at least be amusing to describe the armed surveillance and strict search on egress exercised over the employees when the mine was at work, with the laborious precautions taken for its safety when closed, even in modern times, but space will only permit me to add that, probably from the idea that the graphite was worked out, operations were suspended in 1850; was re-opened again for a short period in 1858, under the auspices of a London company, who, according to local report, could not look for successful results, seeing that they did not give the sett anything like a fair trial.

Certain it is that although several new plumbago mines have been recently opened out, notably the Sturbridge and others in the United States of America, throwing a supply into the market in greater ratio than the largely increased demand, yet the price is still such as would tempt a renewed search in Borrowdale for existing but undiscovered deposits, which, in the absence of any better reason to the contrary than short-lived recent poverty, may be presumed to exist; and, freed from the natural bias which tinges interested statements, the confident general opinion of resident miners conversant with the matter, that judicious working and a little perseverance are all that is needed to open out such another mine, has something at least to found on more stable than a dubious probability.

Returning to the ores of lead and copper, the mines of Greenside and Conistone worthily represent the productive capabilities of the Cambrian range in these metals. The first-named mine, on the confines of Cumberland and Westmoreland, has been most successfully wrought for many years past—a success heightened in no slight degree from the enlightened management exercised, which, with due regard to economy, is careful to secure efficiency by providing dressing and smelting appliances of the most approved and complete character. Owned by a private company of a few individuals, precise information regarding the past and present output is well nigh unobtainable. It is well known, however, that large profits have been, and are now, made by the proprietors of this (from its argentiferous notoriety) well-named silver-lead mine, and which bids fair to be considerably exceeded in future, inasmuch as a new level lately

brought up under existing workings has proved that the lode increases in productiveness as depth is attained. Conistone Copper Mines are well known to have been wrought extensively from a very early period, making large returns of high-priced ore, valued as high as 30,000l. in some years. In instancing these successful mines I do not by any means imply that similar or even approximate results will in all cases necessarily follow the working of contiguous mining ground. My aim is to show that in the North we can also point to great successes, from which we may safely contend that there are many more to reward future honest endeavour.

W. GIBSON.

Caldbeck, July 27.

THE MINERAL WEALTH OF IRELAND.

SIR.—As a constant reader of your valuable Journal, I cannot help noticing how readily the enterprising public of England engage in foreign speculation, while the mineral wealth of this country is, unfortunately, to a great extent disregarded. I could assign many causes for this, which in themselves would seem reasonable enough, but when I look on the vast field which here presents itself, possessing qualities not to be excelled, all other minor considerations disappear, and I must, therefore, give vent to my feelings of regret that so enlightened, enterprising, energetic, and wealthy a people as the British nation can boast should overlook at their own door the very foundation of wealth and prosperity; the hills glitter with its brightness, while the valleys are the receptacles of untold wealth, requiring nothing but skill and capital to reveal its abundance. What branch of industry can be more remunerative than mining when associated with the advantages which are here afforded? Mineral properties possessing qualities which cannot fail to render them highly valuable can be obtained on easy terms; many of them worked to a depth of 50 fathoms and upwards, approaching a point where profitable results would, doubtless, reward the adventurer had he persevered a little further. These mines, many of which were worked in a practical manner till the funds of the companies were exhausted, could now be reworked to great advantage; the labour of years is already wrought, and the capital that would place them in the Dividend List small indeed.

Ireland, too, has for a long time been subject to the inroads of parties possessing but too limited capital, and who have excavated the surface in a manner that might have reflected credit on the ancient Romans. These primitive miners, however, have had their day. It is now high time that modern wealth and science should combine to remove from the public all doubts regarding the mineral deposits of this country, which in my view are equal to any in the kingdom. Copper ore can be obtained in abundance, and wherever a sufficient depth has been attained the adventurer has been amply rewarded. The Berehaven Mine has returned immense profits, and is still a new mine. I could name others on the road to prominence, but as my time is limited I shall make them the subject of a future communication.—Cork, July 26.

N. W.

MINING IN THE SOUTH OF THE ISLE OF MAN.

SIR.—The section of country rock developed along the southern coast of the island is a highly schistose clay-slate formation, and the strike of the beds, particularly in the districts where mining operations are being carried on, is clearly defined, and the main as well as the cross joints of the bedding well filled with most rich looking friable carbonate of lime, thus giving to the structure a highly metalliferous appearance.

The GREAT BRADDA lode is one of vast magnitude, averaging 40 ft. wide in many places, and can be clearly traced intersecting two headlands for a distance of upwards of two miles in length. This champion lode runs in a north and south direction, and has a slight inclination to the west. In times long gone out of date this mine was extensively worked by the ancient miners; evidences of the levels are yet to be seen driven at various points from high-water mark, with a view of extracting the gossans, which abounded in immense deposits near the surface. Some idea may be formed of the great extent of their workings, when I state that there are some thousands of fathoms of lode stuff worked out for this purpose alone. Some few years ago the gossan referred to produced by assay from 4 to 4½ per cent. for copper. At present the principal operations are being carried on at the extreme north point of the headland, where a shaft is sunk some 60 fms. under the level of the sea, and exploration extended at various points, from which large quantities of both lead and copper ores have been obtained. The lode at this point is divided into three parts, but evidently converging in depth, and great results may be looked forward to at such intersections, judging from the fact of late discoveries made in the bottom levels, both in copper and lead ores, together with the favourable geological appearances of the district. I may venture to predict for the undertaking a most successful future.

GLENCASS MINE is situated on a headland near the sea coast, and about 2½ miles to the south of Bradda. A shaft has been sunk in the 80 fm. level, and extended at various depths on the course of the lode, which runs near about a north and south direction, with a slight inclination to west, and averages 2 feet wide, composed of gossan, iron, barytes, quartz, carbonate of lime, and in some places worth fully 6 dwts. of rich silver lead ore to the fathom. At present all operations here are suspended, but I consider, from personal observation, a further capital should be got together for the purpose of exploring two other promising lodes which this sett embraces. Not many years ago some extraordinary rich boulders of platina and silver ore were discovered in a drain, and at a distance of about ¼ mile from the old mine. At the time when this mineral was found no person could give it a name, and it was in the possession of a gentleman from the neighbourhood for some considerable time. A stranger came to the locality, and sent a sample to an eminent assayer in England, and the result was that it reached the enormous value of nearly 9000l. per ton. There is no doubt that by exercising a little careful judgment many important discoveries would be met with in one or two portions of the grant referred to.

BALLACORKISH.—This mining property is situated upwards of two miles to the north-west of the Glencass Mine, and on the north side of the main road leading from Fort St. Mary to Douglas. The sett is intersected by three north and south lodes, with a powerful east and west course, which traverses the full extent of the grant from one extreme point to the other. The lodes are well defined, and embedded in the clay-slate formation of the country, which in this island has been invariably favourable to the production of lead ore. Explorations to a limited extent have been made upon two of these lodes, and the result has been most satisfactory, considering the shallowness of the workings. One of the north and south lodes, upon which the principle workings are now being carried on, averages 2 ft. wide, and composed of gossan, carbonate of lime, blende, and lead ore, and worth of the latter in places fully 2½ tons per fathom. Several parcels of ore have been sent to market, realising a good price, the percentage of silver being from 10 to 12 ozs. to the ton. In some instances samples of ore from this mine have produced from 40 to 60 ozs. of silver to the ton. There is another cargo of ore now at surface, which is a fine sample of the lode. I have studied and taken great interest in this part of the country, and am conversant with every yard of ground on the property. The lodes in question are all pointing and traversing into the hill to the north-east of the present workings, and important results will undoubtedly be met with in that quarter, particularly at the point of intersection, as lodes of this class and description can scarcely fail in making great deposits of mineral. There is another lode of great promise in the grant which has not been explored, but some future day I will endeavour to explain my ideas on this point.

FALCON CLIFF MINE.—This sett is situated about 150 fms. to the east of the Ballacorkish Mine, and is bounded to the north-east by the same property. The grant is very extensive, comprising an area of about 2000 acres, and well watered for mining purposes, together with good roads, and within two miles of an excellent shipping port. The configuration of the district is well adapted for adit level mining, and a great deal might be done by this method. The property is all in virgin ground (or nearly so), and very little has been done towards developing the resources of the promising lodes which this sett is intersected with. In one part, called Bell Abbey Glen, operations have been commenced upon a masterly-looking north and south lode, which can be traced from its outcropping a distance of 90 fms.; it is about

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed. — July 30, 1870.

ay 60 men are employed upon the lole—and I hope to have hundreds bye-and-by—these 60 men would work or excavate and raise to surface $1\frac{1}{2}$ fathom of ground per man each per month, equal to 377. 10s. 2704.—profit, 1890s. Bleed 250s.; expenses, 60 men and costs, at 4s. 10s. each, 2400.—profit, 1890s. Bleed these little facts and figures, how pretty do they look? I do not doubt that you can accomplish this in real life, and I say so, multiply one such lole and five loles together and the results are the same. Further, say the five loles are opened upon a depth of 100 fms. back—be moderate, and multiply the last by 50, then have we gone back? Again, say you find no ore, what is the result then? Answer, *rid*. I thought it best to add this to save someone else the trouble. However, so far as we have gone in our new workings, my figures are not far out; of course, at some points the lole may increase or decrease in value, but depend upon it when we have done with the Queen there will be little wealth left for any after-comers—rather a different matter to our sister rival, the Old Treburget Silver mine. There was a gross insult hurled at me last week; it is accounted for, no